DOCUMENT RESUME

ED 420 108 EA 029 079

TITLE	Reducing Class Size: What Do We Know?
INSTITUTION	National Inst. on Student Achievement, Curriculum, and Assessment (ED/OERI), Washington, DC.
REPORT NO	SAI-98-3027
PUB DATE	1998-05-00
NOTE	19p.
PUB TYPE	Information Analyses (070)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Class Size; Elementary Secondary Education; Literature Reviews; Program Effectiveness; Small Classes; *Teacher Student Ratio

ABSTRACT

Research and common sense suggest that smaller classes offer teachers the chance to devote more time to each student, thus improving student learning. To explore the efficacy of improved teacher-student ratios, an overview of research on class sizes is offered in this report. An analysis of findings from initiatives in various states provides three broad conclusions: first, class-size reduction in the early grades leads to higher student achievement, with significant effects of class-size reduction appearing when classes contain somewhere between 15 and 20 students, and continue to increase as class size approaches a one-to-one ratio; second, if class size is reduced from substantially more than 20 students per class to below 20 students, the related increase in student achievement moves the average student from the 50th percentile up to somewhere above the 60th percentile; and finally, students, teachers, and parents all report positive effects from the impact of class-size reductions on the quality of classroom activity. However, class-size reduction represents a considerable commitment of funds, and its implementation can have a sizable impact on the availability of qualified teachers. (RJM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

EA

ED 420 108

Reducing Class Size: What Do We Know?

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

U.S. Department of Education
May 1998

SAI 98–3027

EA029079

Introduction

Research and common sense suggest that smaller classes offer teachers the chance to devote more time to each student so as to improve their learning. A number of states have already implemented class size reduction programs, and others are in the process of development. Skeptics worry that reducing class size will increase costs without producing substantial benefits, however, and class size reduction programs certainly present challenging problems as well as opportunities. Does reducing class size really improve students' education? Should teachers hired to teach in smaller classes be prepared differently? Will hiring more teachers in order to reduce class size exhaust the supply of qualified teachers? The available research evidence contains some useful guidance for educators and policy makers who face these questions as they try to craft the most beneficial class size reduction strategies.

Research On Class Size

Researchers have used various techniques to study how class size affects the quality of education. They have looked at the relationship between class size and student achievement, and have conducted various kinds of studies related to class size and its possible influences on educational practice. In the last 20 years, enough research has been done for researchers to have taken the results of many experiments and data collections and synthesized the accumulated findings into general conclusions. In some analyses, the researchers have used data about student/teacher ratios as a means to examine the class size effects, because the original research lacked a direct measure of class size. Some of the statistical analyses in the last 10 years have been quite large in scale.

Several recent experimental studies have contributed substantially to the research knowledge about class size. Not all the questions about the impact of class size reductions have been answered, nor have all the debates been settled. Overall, however, the pattern of research findings points more and more clearly toward the beneficial effects of reducing class size.

Research Syntheses

Several major analyses have used various analytical methods to draw conclusions through reviews of already existing research studies. The methods used and the studies included vary somewhat, but most of them have concluded that reducing class size is related to increased student learning:

- In 1978, Smith and Glass published a *meta-analysis* combining the results of 77 empirical studies pertaining to the relationship between class size and achievement, and soon followed it with a second meta-analysis analyzing the relationship between class size and other outcomes. Overall, they found that small classes were associated with higher achievement at all grade levels, especially if students were in the small classes for more than 100 hours, and if student assignment was carefully controlled. They found that the major benefits of reducing class size occurred where the number of students in the class was fewer than 20. In their second study, they concluded that small classes were superior in terms of students' reactions, teacher morale, and the quality of the instructional environment.[1]

- In 1989, Slavin employed a *best evidence synthesis* strategy to analyze empirical studies that met 3 specified criteria: a study was included only if class size had been reduced for at least a year, classes of less than 20 students were compared to substantially larger classes, and students in the larger and smaller classes were comparable. Slavin found that reduced class size had a small positive effect on students that did not persist after their reduced class experience.[2]

- In 1986, Robinson and Wittebols published a review of more than 100 relevant research studies using a *related cluster analysis* approach. Similar kinds of research studies were "clustered" or grouped together, such as studies of the same grade level, subject area, or student characteristics. They concluded that the clearest evidence of positive effects is in the primary grades, particularly kindergarten through third grade, and that reducing class size is especially promising for disadvantaged and minority students. At the same time, they cautioned that positive effects were less likely if teachers did not change their instructional methods and classroom procedures in the smaller classes.[3]

Other research analyses have concluded that class size reduction does not have an appreciable effect. Tomlinson examined trend data from the 1950s to 1986 in the United States and did not find any consistent relationship between class size and standardized test scores; he concluded that the existing research did not justify a policy to reduce class size, in view of the costs involved and the potential negative impact on the quality of the teaching force.[4] Critics pointed out that this analysis combined students from all grade levels together, that the reliance on student/teacher ratios was an inadequate measure of class size, and that Tomlinson ignored a host of intervening factors and social changes which may have masked the relationship.[5] Odden reviewed the existing research and argued that a system-wide class reduction policy would produce only modest gains in student achievement and incur an unjustifiably high cost. He opted instead for certain targeted class reduction strategies in conjunction with a series of other interventions, and claimed that his proposals could produce greater benefits with lower costs.[6] An analysis of the relationship between class size and student achievement for Florida students using 1993-94 school level data found no relationship between smaller classes and student achievement; however, the study's authors expressed caution about drawing conclusions from the analysis, based on the limitations of the available data.[7]

More positive conclusions have been drawn from an analysis of a substantial database about the Texas education system. Using data from more than 800 districts containing more than 2.4 million students, Ferguson found significant relationships among teacher quality, class size, and student achievement. For 1st through 7th grade, using student/teacher ratio as a measure of class size, Ferguson found that district student achievement fell as the student/teacher ratio increased for every student above an 18 to 1 ratio. Measures of teacher quality (that is, teacher literacy skills and professional experience) were even more strongly related to higher student scores.[8]

Hanushek has repeatedly reviewed the available studies that permit a comparison of various school resource inputs - including class size reductions - and student outcomes and has concluded that reducing class size should not be expected to produce better student performance. His analyses have found that the relationships between various school expenditures - including class size reductions - are remarkably weak, leading him to call for a drastic re-thinking of public education policy.[9] Others have used somewhat different analytical techniques to examine the same data and have disputed Hanushek's conclusions, arguing that the data do show important effects for student achievement, including the influence of smaller classes.[10] Still others have raised questions about the limitations of the basic analytical approach used here because it relies on student/teacher ratios as a measure for class size, it usually groups the data for all grade levels together, and the data represent student achievement at

the level of school or school district average scores instead of representing individual students placed in larger or smaller classes.[11]

A National Scale Analysis of Data Related to Class Size

In 1997, Wenglinsky published research findings concerning the relationship between class size and student achievement based on his analysis of data drawn from three national level databases. The study was designed to investigate the relationship between spending in education and student performance, and combined data from three different databases generated by the National Center for Education Statistics. Based on an analysis of data on 4th-graders in 203 districts and 8th-graders in 182 school districts from across the United States, Wenglinsky found that class size served as an important link between school education spending and student mathematics achievement at both the 4th- and the 8th-grade levels, although in different ways:

- At the 4th-grade level, lower student/teacher ratios are positively related to higher mathematics achievement.
- At the 8th-grade level, lower student/teacher ratios improve the school social environment, which in turn leads to higher achievement.

For purposes of the analysis, Wenglinsky divided the school districts included in the study according to whether they served above-average or below-average socioeconomic status students, and whether they had above-average or below-average teacher costs. With respect to these four subgroups of districts, the largest effects for mathematics achievement gains occurred in districts where there were below-average socioeconomic status students, accompanied by above-average teacher costs.[12]

Recent Experimental Studies of Class Size

Data from several more recent initiatives have added considerably to the research evidence concerning class size reduction in the United States in the early primary grades. Efforts in Indiana, Tennessee, North Carolina, and Wisconsin have reported important data, with the Tennessee projects currently providing the most complete and well-designed study of class size reduction effects.

Indiana

Beginning in 1984, Indiana's *Prime Time* project allocated money to support the reduction of class size to 18 in 1st-, 2nd-, and then kindergarten and 3rd-grade

classrooms. Implementation of *Prime Time* was not rigorously controlled, and the results were mixed. An evaluation of the *Prime Time* project analyzed achievement scores for 1st- and 2nd-grade students, comparing mean class scores in reading and mathematics from 10 school districts for tests that were administered the year immediately preceding the project with tests administered in the first year of the project. In these districts, the average 1st- grade class size was reduced from 22 to 19 students, and in 2nd-grade from 21 to 20 students. Tests of student achievement found that for students in the smaller classes, the reading scores for 1st-graders showed the greatest improvement, with smaller gains in mathematics.[13]

Tennessee

Tennessee's *Project STAR* (Student-Teacher Achievement Ratio) and two associated data collections have made important contributions to the quality of research evidence concerning the reduction of class size. *STAR* was a 4-year longitudinal study of kindergarten, 1st-, 2nd-, and 3rd-grade classrooms in Tennessee which began in 1985. *STAR* compared classes of 13-17 students with classes of 22-26 students both with and without an additional instructional aide in the larger classes. Participating teachers did not receive any professional training focusing on teaching in reduced size classes. *STAR* was unusual because it possessed essential features of a controlled research experiment designed to produce reliable evidence about the effects of reducing class size:

- *Study size.* *Project STAR* included 79 schools, more than 300 classrooms and 7,000 students, with students being followed through 4 years of experience in the given class size.

- *Random assignment.* Teachers and students were randomly assigned to the three different kinds of classes in order to ensure that the study was not biased by who was in which type of class.

- *In-school design.* All participating schools implemented at least one of each of the three types of classes in order to cancel out the possible influences coming from variations in the quality of the participating schools that might affect the quality of the classroom activity.

The evidence from student testing in *STAR* showed that the students in the smaller classes outperformed the students in the larger classes, whether or not the larger class teachers had an aide helping them. *Project STAR* found that:

- Smaller class students substantially outperformed larger class students on both standardized (Stanford Achievement Tests) and curriculum-based tests (Basic Skills First). This was true for white and minority students in smaller classes, and for smaller class students from inner-city, urban, suburban, and rural schools.

- The positive achievement effect of smaller classes on minority students was double that for majority students initially, and then was about the same.

- A smaller proportion of students in the smaller classes were retained in-grade, and there was more early identification of students' special educational needs.

- There were no significant differences in academic achievement for students in the larger classes with or without an additional instructional aide.[14]

Subsequent efforts provided important additional evidence on the positive effects of class size reduction. In 1989, the *Lasting Benefits Study* began a follow-up study to examine whether the effects of the smaller class size experience persisted when students were returned to normal size classes. The study is still ongoing. To date, the research findings include:

- In fourth grade, students from the smaller classes still outperformed the students from the larger classes in all academic subjects.

- In fourth grade, students from the smaller classes were better behaved than students from the larger classes (i.e., student classroom effort, initiative, and disruptiveness).

- At least through eighth grade, a decreasing but still significant higher academic achievement level for the students from the smaller classes persists.[15]

In *Project Challenge*, Tennessee sought to put the *Project STAR* findings to use by implementing smaller class sizes in 16 of the state's poorest school districts. Beginning in 1990, the state phased in smaller classes at the kindergarten through 3rd-grade levels in districts with the lowest per capita income and highest proportion of students in the subsidized school lunch program. The results of this effort were evaluated by examining the effect on the ranking of the school districts according to student performance on a statewide achievement test. The *Project Challenge* districts moved from near the bottom of school district performance in Tennessee to near the middle in both reading and mathematics for second grade.

Project Challenge districts' average rankings before and after class size reduction, according to second grade student achievement in reading and mathematics:

Total number of districts in Tennessee: 138	Average ranking of *Project Challenge* districts before class size reduction (1990)	Average ranking of *Project Challenge* districts after class size reduction (1993)
Second Grade Reading Achievement	99	78
Second Grade Mathematics Achievement	85	57

In addition, in-grade retention of students was reduced in the *Project Challenge* districts when smaller classes were implemented.[16]

Taken together, the Tennessee studies have been viewed as landmark research. Finn concluded that "this research leaves no doubt that small classes have an advantage over larger classes in school performance in the early primary grades."[17] Mosteller, Light, and Sachs called it "...one of the great experiments in education in U.S. History."[18]

Burke County, North Carolina

A recent initiative to reduce class size in Burke County, North Carolina, has also produced noteworthy data. Beginning in 1990, Burke County pilot-tested and then phased in a class size reduction project in the county school district. In 1995-96, 1,193 1st-graders and 1,125 2nd-graders participated in the initiative. The program's goal has been to reduce class size to 15 students in all 1st, 2nd, and 3rd-grade classes.

The Burke County project also included professional development activities covering instruction and assessment, and so the effects are not necessarily simply a function of reducing class size. Evaluation of the initiative has produced the following findings:

- Compared to a matched group of students in classes that had not been phased into the smaller class initiative, students in the smaller classes outperformed the comparison group in 1st-, 2nd, and 3rd grade on both reading and mathematics achievement tests.

- Based on independent observations of classroom activity, the percentage of classroom time devoted to instruction in the smaller classes increased from 80 percent to 86 percent compared to the larger classes, while the percentage of time devoted to non instructional activities such as discipline decreased from 20 percent to 14 percent.[19]

Wisconsin

Beginning in 1996 - 97, Wisconsin began a class size reduction program called the *Student Achievement Guarantee in Education (SAGE) Program. The SAGE Program's* objective is to phase in class size reduction in kindergarten through third grade in school districts serving students from low-income families. The *SAGE Program* is being implemented in stages, and its aim is to reduce the class size in the appropriate grade levels to a student/teacher ratio of 15 to 1 or less. In the first annual evaluation of the program, *SAGE* students' academic learning in first grade classrooms was measured in October 1996 and again in May 1997. The students' scores were compared to those of students in matching comparison schools serving similar populations of students with the following results:

- *SAGE* students consistently performed better than comparison students on various areas of the Comprehensive Test of Basic Skills.

- The gap between white and African-American students in achievement did not widen, in contrast to a widening of the gap between white and African-American students in the comparison student groups.

These findings are consistent with the findings in *Project STAR*, but there are two important qualifications to make regarding the *SAGE* project data: first, these are preliminary first year evaluation data, and so the findings of this research may change substantially as the program is phased in and students experience more than 1 year in a smaller class. Second, the *SAGE* project class size reductions were accompanied by

other initiatives: participating schools were also required to implement a rigorous academic curriculum, provide before and after school activities for students and community members, and implement professional development and accountability programs. The first year evaluation of *SAGE* reported uneven implementation of these other components of the *SAGE Program*, but it is obviously possible that some of the positive results reported for *SAGE* are at least in part due to the other *SAGE* program components.[20]

Summary Research Conclusions

Overall, the pattern of findings drawn from the existing research lead to the following three conclusions:

1. A consensus of research indicates that class size reduction in the early grades leads to higher student achievement. Researchers are more cautious about the question of the positive effects of class size reduction in 4th through 12th grade. The significant effects of class size reduction on student achievement appear when class size is reduced to a point somewhere between 15 and 20 students, and continue to increase as class size approaches the situation of a 1-to-1 tutorial.

2. The research data from the relevant studies indicate that if class size is reduced from substantially more than 20 students per class to below 20 students, the related increase in student achievement moves the average student from the 50th percentile up to somewhere above the 60th percentile. For disadvantaged and minority students the effects are somewhat larger.

3. Students, teachers, and parents all report positive effects from the impact of class size reductions on the quality of classroom activity.

State Initiatives

Large scale efforts to reduce class size have not been limited to Indiana and Tennessee. Some states initiated targeted class size reduction policies some time ago, while others are only in the early stages of development and implementation. In 1984, Texas passed legislation requiring class size to be limited to 22 students in kindergarten through 4th-grade, with the provision going into effect for kindergarten through 2nd-grade in 1985-86 and for 3rd- and 4th- grade in 1988-89.[21] Nevada began a class size reduction program in 1990-91, beginning with a target of a 15 to 1 student/teacher ratio for kindergarten and 1st-grade, then applying that ratio in 2nd-grade and 3rd-grade, to be followed by efforts to reduce the ratio to 22 to 1 for 4th through 6th-grade, and then 25 to 1 for 7th through 12th-grade.[22] In 1995, Virginia began an effort to reduce class size in kindergarten through 3rd-grade classes for at-risk students, using a strategy in which local systems that devote funds to the voluntary program may receive matching funds from the state.[23] Other states reported to be involved in or considering some sort of class size reduction initiative include Arizona, Connecticut, Florida, Georgia, Hawaii, Illinois, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Nebraska, New Hampshire, New York, North Carolina, Oklahoma, and Utah.[24]

In the 1996-97 school year, California began its *Class Size Reduction Program*, through which it is giving money to school districts for the purpose of reducing the student/teacher ratio to 20 to 1 in kindergarten through 3rd-grade.[25] The California *Class Size Reduction Program* represents an important initiative whose implementation may provide instructive lessons. In the 1997-98 school year, 1.9 million children were assigned to smaller classes in California schools. California school districts hired 18,000 new teachers in 1996, and almost one-quarter of them had no teaching credentials. Districts also have had to use various means to create sufficient classroom space.[26] Classroom size reduction clearly increases the demand for more classrooms and qualified teachers. Implementation of class size reduction policies on a large scale require careful planning and attention.

The impact of class size reduction reforms, their cost, and their relationship to professional development are major questions facing current education reform in the United States. Only with information about these questions will policy makers be able to make knowledgeable decisions about the cost-effectiveness and feasibility of various reform options.

Discussion

Why Do Smaller Classes Make a Difference?

Teachers (and principals and parents as well) consistently welcome proposals to reduce class size. On being assigned to smaller classes, teachers report that the classroom atmosphere is better, that students can receive more individualized attention, and that the teachers have more flexibility to use different instructional approaches and assignments.[27] One unanticipated result of the Burke County reduced class size initiative was that the teachers found themselves with more classroom space to work with because they were using the same classrooms with a smaller number of students.[28]

The reduction of class size itself changes the classroom situation. There are fewer students to distract each other. Each student in a reduced size class gets more attention on average from the teacher, and more time to speak while the others listen. Similarly, each student would have to be louder in order to create the same noise level as a larger class. One theory offered to explain the positive effects of class size reduction on student achievement simply argues that in smaller classes each student receives a larger portion of the educational resources represented by the teacher's instructional time, and consequently, learns more.[29]

Researchers also have suggested that smaller classes are more likely to be "friendlier" places, where students develop better relationships with their classmates and with the teacher, encouraging students to become more engaged in classroom learning activities. The smaller the class, the harder it is to escape the positive influence of the classroom educational experience. The research finding that reduced class size is particularly beneficial in the early grades may result from the fact that in the early grades children are learning how to be students in classrooms where the number of people is larger than the number of people in their families, and students are learning a new routine.[30]

The focus on the early grades also suggests that smaller classes represent a preventive, rather than a remedial approach. If smaller classes help students start off on the right foot in learning how to adjust to the classroom situation and get engaged in learning activities, then students avoid the more difficult educational path of falling behind, attracting the appropriate assistance, and catching up to their schoolmates.

When is a Reduction Not a Reduction?

The question of class size is not simply a matter of less is more. The pattern of research evidence only favors class size reduction if it is substantial and brings the class size below a certain threshold. Reducing class size from 30 to 25, for example, may well have no effect whatsoever. The research evidence from *Project STAR* showed that students in smaller classes with fewer than 18 students did better when compared with students in larger classes. Given the variations among individual students and teachers and the way they interact, it is unlikely that there is a single "magic number" below which class size suddenly produces a beneficial effect. But it is fairly clear that class size must get somewhere below 20 in order to make a real difference.

Reducing the ratio of students to teachers does not necessarily mean a reduction in class size. This issue was a complicating factor in the research studies described earlier, where questions were raised about the adequacy of using the student/teacher ratio as a measure of class size. Policy initiatives may aim to change the ratio of students to teachers, and if reduced class size is key, such initiatives may miss the mark. Some initiatives permit officials to include other education staff besides the classroom teachers in the calculation of the ratio, such as resource teachers in special education, music, and physical education. Consequently, school systems could increase the number of teachers without necessarily reducing class size; and particularly since the number of available classrooms is both a practical and a budget issue, officials may be tempted to solve the ratio problem by adding another teacher to a larger class. The research findings from *Project STAR* are relevant here: the larger classes with instructional aides did *not* produce the same benefits as the smaller classes.

Reducing class size does not necessarily reduce the teacher's workload, or even the number of students they teach each day.[31] If a teacher is assigned to teach more classes because the number of students in each class is reduced, the teacher spends more time teaching and has no fewer students. Such problems might be resolved by strategies such as year-round schooling, but this still implies either that teachers teach all year or that more teachers get hired. The common assumption is that smaller classes allow teachers to increase the time devoted to each student, either individually or in smaller groups, and thereby improve the quality of the students' education. If this assumption is true, successful class size reduction programs will have to attend to the impact on teachers' workloads.

School arrangements that reduce class size only for particular students or

subjects may achieve greater results with lower costs, depending on how they are organized and what exactly makes the smaller class experience better. It may be more important to reduce class size for reading than for physical education, and the research suggests that minority and economically disadvantaged students benefit most from smaller classes. Educators and policy makers should not blindly assume that an across-the-board, across-the-school-day approach to class size reduction is best.[32]

What Do Teachers Do or Not Do, and How Might They Do Better?

Effective professional training may augment the positive effects of reduced class size beyond whatever gains are generated by reduced class size alone. Reduced classes offer teachers the opportunity to teach differently from the way they teach in larger classes. They don't have to spend as much time lecturing, for example, or having all the students doing worksheets at their own desks. Having more time for students means that teachers can organize classroom learning activities differently and have students demonstrate their achievement through exercises that don't have to be read or corrected in the shortest time possible. In the Burke County project, for example, the reduced class size initiative was coupled with professional development activities designed to enable teachers to use different instructional strategies and different assessment methods. Wisconsin's *SAGE Program* also includes professional development efforts. If schools are going to devote substantial energy and resources to reducing class size, the extent of the benefits derived from such efforts may depend in part on how teachers take advantage of the smaller class size to improve the quality of students' educational experiences.

Teachers do not necessarily change their behavior when they move to smaller classes. In one observational research study, even though the teachers assigned to smaller classes thought they were teaching differently, the independent observers saw no discernable difference in teacher behavior.[33] Research studies suggest that teachers do not just automatically change their behavior to optimize the potential benefits of smaller class size,[34] and there is a considerable body of research that shows that creating substantial changes in teachers' classroom behavior is no easy feat. Both teachers who are used to teaching in larger classes and teachers newly hired due to the hiring needs associated with class size reduction initiatives will need to have professional training and support to enable them to utilize more fully the advantages of smaller classes. It is clear that many schools will face this challenge in the coming years.[35] The best ways to meet that challenge remain to be found.

Conclusion

Reducing class size to below 20 students leads to higher student achievement. However, class size reduction represents a considerable commitment of funds, and its implementation can have a sizable impact on the availability of qualified teachers. Strengthening teacher quality also leads to higher student achievement. There is more than one way to implement class size reduction, and more than one way to teach in a smaller class. Depending on how it is done, the benefits of class size reduction will be larger or smaller.

Endnotes

[1] Glass, Gene V., Leonard S. Cahen, Mary L. Smith, and Nikola N. Filby. 1982. *School class size: Research and policy*. Beverly Hills, CA: Sage.

[2] Finn, Jeremy D. 1998. *Class size and students at risk: What is known? What is next?* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, National Institute on the Education of At-Risk Students.

[3] Robinson, Glen E. and James H. Wittebols. 1986. *Class size research: A related cluster analysis for decision-making*. Arlington, VA: Education Research Service.

[4] Tomlinson, Tom. 1988. *Class size and public policy: Politics and panaceas*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

[5] See Finn 1998 and Charles M. Achilles, 1996. "Students achieve more in smaller classes." *Educational Leadership* 53 (5): 76-77.

[6] Odden, Allan. 1990. "Class size and student achievement: Research-based policy alternatives." *Educational Evaluation and Policy Analysis* 12 (2): 213 - 227.

[7] Florida Department of Education. Office of Policy Research. 1998. "The relationship of school and class size with student achievement in Florida: An analysis of statewide data." http://www.firn.edu/doe/bin00048/home0048.htm.

[8] Ferguson, Ronald F. 1991. "Paying for public education: New evidence on how and why money matters." *Harvard Journal on Legislation* 28 (2): 465 - 498.

[9] Hanushek, Eric A. 1998. "The evidence on class size." Public Testimony, Washington, DC.

[10] Greenwald, Rob, Larry V. Hedges, and Richard D. Laine. 1996. "The effect of school resources on student achievement." *Review of Educational Research* 66 (3): 361 - 396. See also Hanushek, Eric A. 1996. "A more complete picture of school resource policies." *Review of Educational Research* 66 (3): 397-409 and Greenwald, Rob, Larry V. Hedges, and Richard D. Laine. 1996. "Interpreting research on school resources and student achievement: A rejoinder to Hanushek." *Review of Educational Research* 66 (3): 411 - 416.

[11] See Finn 1998 and Achilles 1996.

[12] Wenglinsky, Harold. 1997. *When money matters: How educational expenditures improve student performance and how they don't*. Princeton, NJ: The Educational Testing Service, Policy Information Center.

[13] Mueller, Daniel J., Clinton I. Chase, and James D. Walden. 1988. "Effects of Reduced Class Size in Primary Classes." *Educational Leadership* 45 (7): 48-50.

[14] Achilles, Charles M., Barbara A. Nye, Jayne B. Zaharias, B. DeWayne Fulton, and C. Cain. 1996. "Education's Equivalent of Medicine's Framingham Heart Study." Washington, DC: ERIC Clearinghouse. ED 402677. See also Mosteller, Frederick. 1995. "The Tennessee Study of Class Size in the Early School Grades." *The Future of Children* 5 (2): 113-127.

[15] Finn 1998. Nye, Barbara, B. DeWayne Fulton, Jayne Boyd-Zaharias, and Van A. Cain. 1995. *The Lasting Benefits Study, Eighth Grade Technical Report*. Nashville, TN: Center of Excellence for Research in Basic Skills, Tennessee State University.

BEST COPY AVAILABLE

[16] See Mosteller 1995, Finn 1998, and Kickbusch, Ken. 1996. "Class Size." Madison, WI: Wisconsin Education Association Council, Professional Development Division. http://www.weac.org/resource/may96/classize.htm.

[17] Finn 1998, p. 8.

[18] Mosteller, Frederick, Richard J. Light, and Jason A. Sachs. 1996. "Sustained Inquiry in Education: Lessons from Skill Grouping and Class Size." *Harvard Educational Review* 66 (4): 797-842.

[19] Egelson, Paula, Patrick Harman and Charles M. Achilles. 1996. *Does Class Size Make a Difference? Recent Findings from State and District Initiatives*. Washington, DC: ERIC Clearinghouse. ED 398644. See also Finn 1998.

[20] Maier, Peter, Alex Molnar, Stephen Percy, Phillip Smith, and John Zahorik. 1997. "First Year Results of the Student Achievement Guarantee in Education Program." Milwaukee, WI: University of Wisconsin-Milwaukee.

[21] Texas Education Agency. 1998. "Update on Class Size Waivers, Bilingual Education Exceptions, and Waivers for English as a Second Language." http://www.tea.state.tx.us/sboe/schedule/9801/dppef010.html.

[22] Sturm, Pepper. 1997. "Nevada's Class-Size Reduction Program." Carson City, NV: Senate Committee on Human Resources. http://www.leg.state.nv.us/leb/research/bkground/97-07.HTM. See also Egelson et al. 1996.

[23] Egelson et al. 1996.

[24] Achilles et al. 1996 and AIR, RAND, PACE, and EdSource. 1998. *Evaluating California's Class Size Reduction Initiative: The Year 1 Data Collection Component*. Grant proposal submitted to the Koret Foundation, Palo Alto, CA.

[25] California. Senate. "Class Size Reduction." S.B. 804. Chaptered August 18, 1997.

[26] AIR et al. 1998.

[27] Mosteller 1995, Kickbusch 1996, and Maier et al. 1997.

[28] Egelson et al. 1996.

[29] Mitchell, Douglas, Christi Carson, and Gary Badarak. 1989. *How Changing Class Size Affects Classrooms and Students*. Riverside, CA: California Educational Research Cooperative, University of California.

[30] Finn 1998.

[31] Kickbusch 1996.

[32] See Odden 1990 and Mitchell et al. 1989.

[33] Wright, Edgar N., Stanley M. Shapson, Gary Eason, and John Fitzgerald. 1977. Effects of Class Size in the Junior Grades: A Study. Toronto, Ontario: Ontario Ministry of Education, Ontario Institute for Studies of Education.

[34] See Mitchell et al. 1989 and Robinson and Wittebols 1986.

[35] One research study currently under way is being carried out by Brian Stecher and Cathleen Stasz of the RAND Corporation, with funding from the Field-Initiated Studies Program in the Office of Educational Research and Improvement, U.S. Department of Education. This study,

BEST COPY AVAILABLE

entitled "The Effects of Class Size Reduction on Students Opportunities to Learn," is investigating whether reduced class size classes are related to changes in the various kinds of learning opportunities experienced by students.